CANADA

DEPARTMENT OF MINES AND TECHNICAL SURVEYS

MINES BRANCH

OTTAWA

FUELS DIVISION

TECHNICAL MEMORANDUM 100/58-Prep.

APPARATUS FOR QUICK DETERMINATION OF ASH IN COAL

by

J. Visman

FOR DEPARTMENTAL USE ONLY

(Copy No. ___)

June 3, 1958.

90-04543/

APPARATUS FOR QUICK DETERMINATION OF ASH IN COAL

by

J. Visman*

SUMMARY

The method and apparatus described were originally developed for quality control purposes in a coal washery.

As the accuracy of the ash determination is very close to the accuracy obtained with the ASTM methods, the method can also be used with advantage, as a time-saver in the analysis of shift samples or individual car samples.

The procedure is basically the same as the conventional method, with this difference that the drying of the sample and the ash determination are speeded up by using apparatus of special design. The method deals essentially with wet or dry samples of coal minus ¼", with a total weight of up to 3 or 4 lb.

DRYING THE SAMPLE

Gross samples from the washery received in the plant laboratory are usually prepared by crushing and splitting until a suitable weight of sub-sample is obtained for the final reduction step which precedes the actual analysis.

This report is not concerned with the initial step or steps of sample preparation which can be done with a comparatively small loss of time. It is concerned only with the preparation of a wet or dry sample that has been reduced to a size of minus ¼" and to a weight of 4 lb at the maximum.

* Senior Scientific Officer, Division of Fuels, Mines Branch, Department of Mines and Technical Surveys, Edmonton, Alberta, Canada.

It is in the drying and grinding of the final sample that time is being lost, more so than in the initial preparation.

When dealing with wet samples of minus ¼" coal, drying can be accelerated by using hot compressed air.

In the apparatus shown in Fig. 1 the wet coal sample is put into a container of rust proof material e.g. stainless steel, with a perforated bottom of a 28 or 48 mesh wire-cloth screen supported by a 2 or 3 mesh stainless steel grid.

The container is snapped on to the actual drier by means of a bayonet lock and compressed air is admitted at the other end.

The drying process takes approximately two to three minutes, in which most of the water is expelled by displacement which minimizes heat required for drying. The remaining moisture is quickly evaporated by passing air through at an elevated temperature, which is provided by a calrod element.

The apparatus can be made up locally and of old pipe and fittings at a minimum cost. For details see Fig. 1.

The dried sample is passed through a pulverizer, preferably a hammermill with a sieve to ensure a maximum particle size of 60 mesh. The sample is thoroughly mixed and reduced in a splitter to an analytical sample of 50 - 100 grams.

QUICK ASH ANALYSIS

A sample of 250 milligrams is collected with a special spoon, shown in Fig. 2 (for dimensions of this spoon see the nomogram following Fig. 2).

This weight of approximately 250 mg is obtained by collecting a heaping spoonful and carefully wiping off the surplus coal with a knife so that the surface of the coal remaining in the spoon is flat and flush with the circular edge of the spoon. The exact weight of the analytical sample thus obtained is determined by weighing it in a platinum boat of known weight, on an analytical balance. For dimensions of this platinum boat see Fig. 2.

The boat and sample are then placed in the heated quartz tube (inner dia 5/8") as shown in Fig. 2. Oxygen is admitted at a low rate and the coal will burn off with a bright glow in approximately one minute, leaving a dull-glowing residue of ash. Sparking of coal indicates too high a rate of oxygen and should be avoided.

The finished probe is removed and the boat allowed to cool on a porcelain tablet or steel plate for approximately thirty seconds. The weight of the ash is now determined by reweighing the boat with the residue.

The ash content is found from the two weights by using the nomogram included at the back of this report. The whole operation of ash determination can be done in approximately eight minutes.

The method gives accurate results (s = 0.15% ash) and is recommended for plant control purposes.

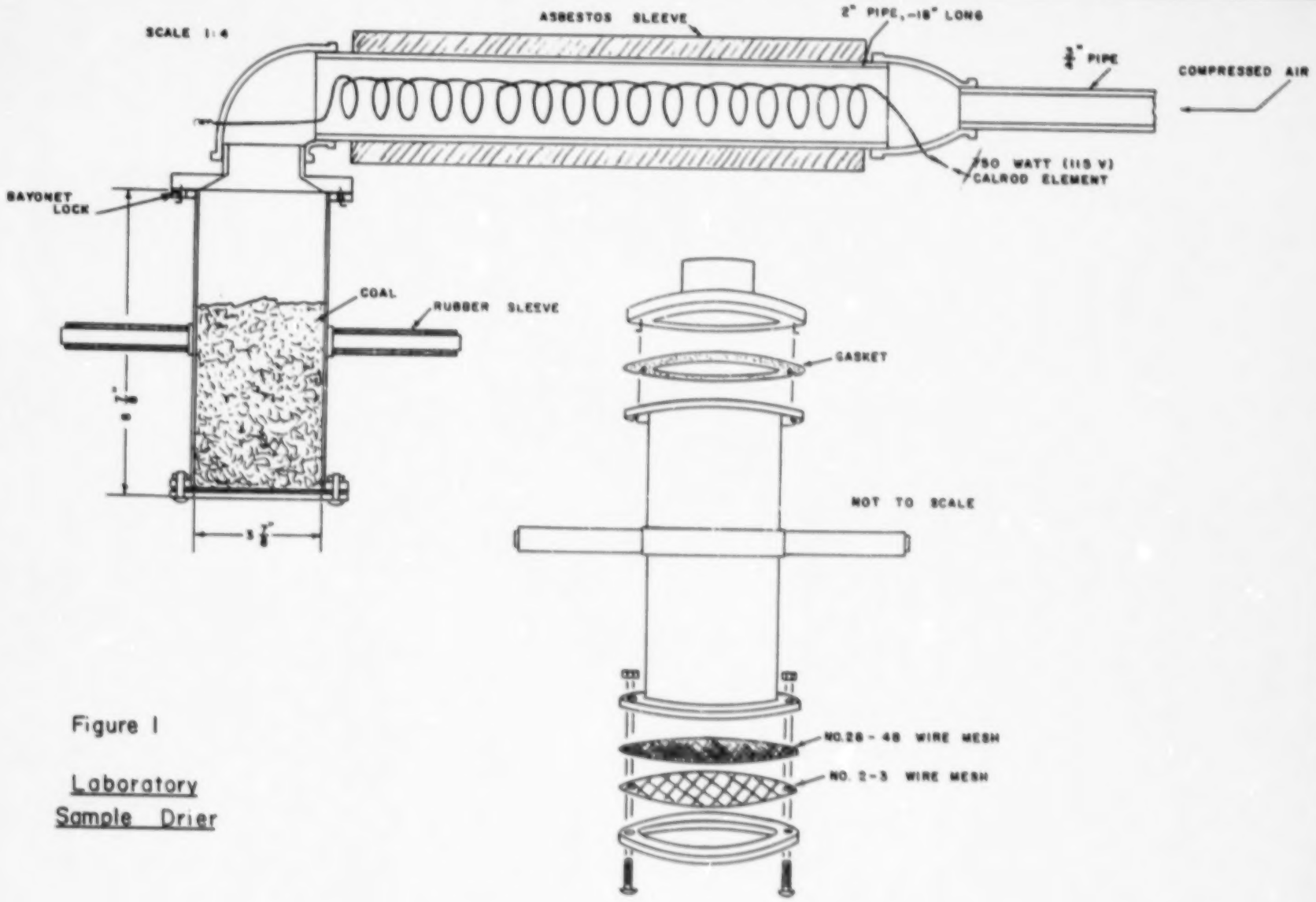


Figure 1

Laboratory
Sample Drier

J.P. 30.5.58

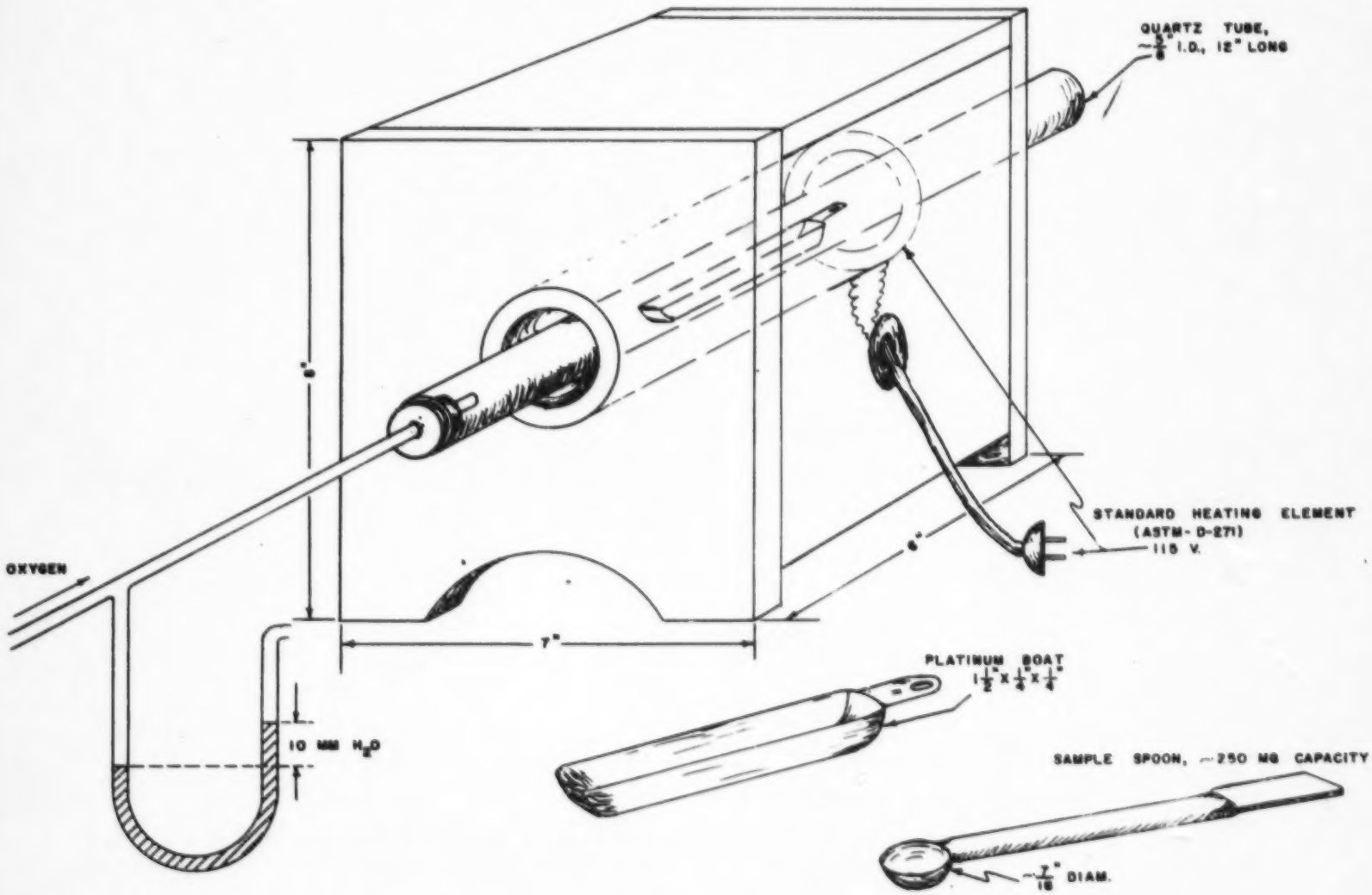
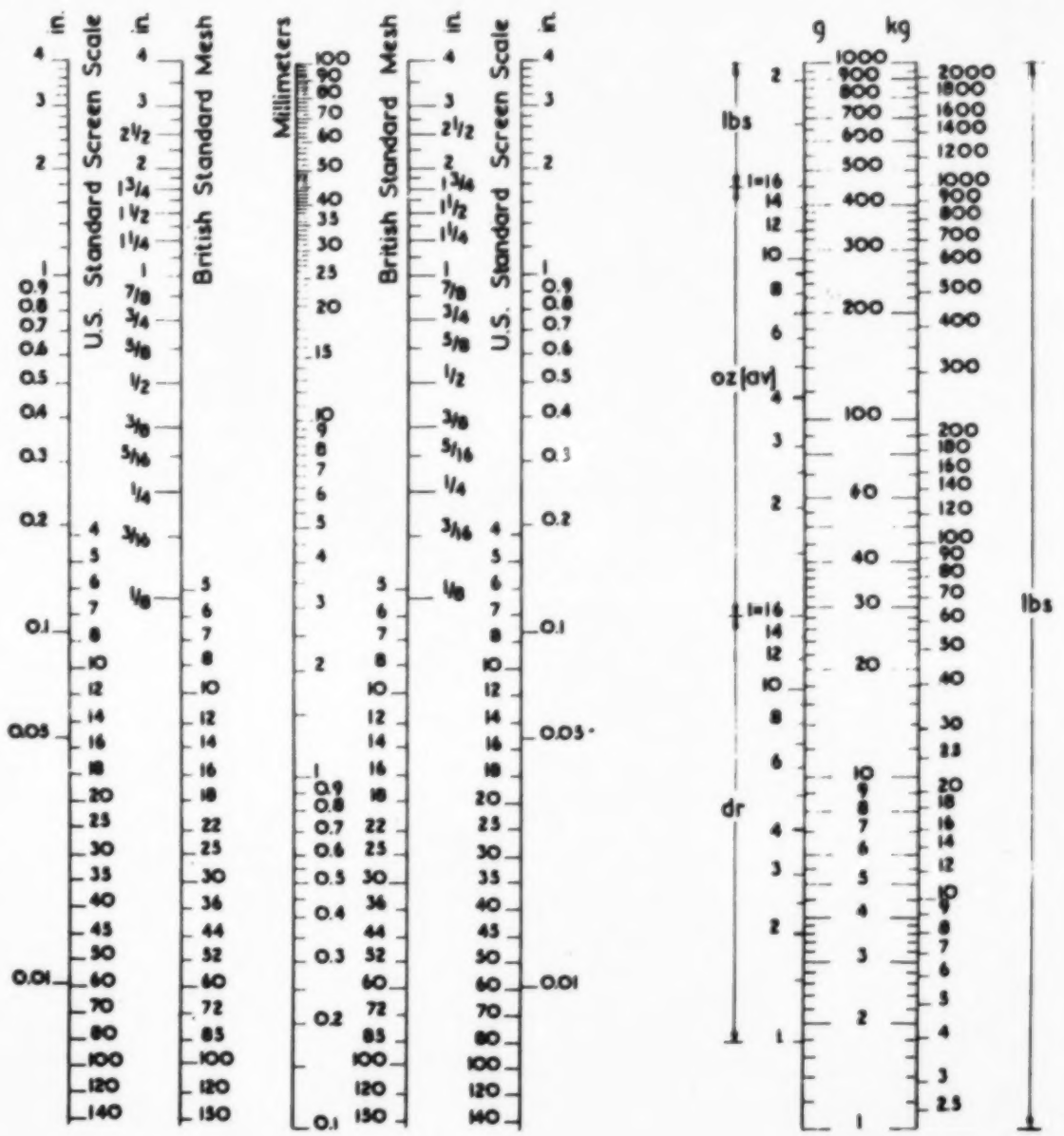


Figure 2- Apparatus for Rapid Determination of Ash Content

J.P. 2-6-58

GRADUATED SCALES FOR SIEVE OPENINGS AND WEIGHTS



Nomogram For Quick Ash Determination